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Acarospora squamulosa, the correct name for *A. peliocypha*

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Abstract—The epithet of the species widely known as *Acarospora* "*peliscypha*" should be restored to its original orthography, *A. peliocypha*. The oldest name for this species is *Lichen squamulosus,* which has priority. *Lichen squamulosus* is lectotypified. *Acarospora squamulosa* replaces the later name *A. peliocypha*. *Acarospora squamulosa* is reported for continental North America from Baffin Island, Nunavut Territory, Canada.

Key words—*Acarospora rugulosa*, nomenclature, priority, taxonomy

Introduction

Although stability in nomenclature is desirable, it is not always achievable. Improvements in the understanding of taxonomy often necessitate changes in names, and the molecular revolution has caused, and will continue to cause, massive changes to the taxonomy of lichenized fungi, with corresponding changes in names. Another source of instability can be the need to achieve consensus about names. Consensus is achieved by applying the rules of the International Code of Nomenclature, as those rules are accepted throughout the botanical and mycological community, but "consensus" and "stability" come into conflict in cases where the rules imply that a commonly used name is not the correct one. In such cases, a judgment must be made about whether to accept a change in name or to invoke the cumbersome procedure of conservation to preserve the more familiar usage. In this paper we resurrect the name *Acarospora squamulosa* for the species currently known as *A. peliocypha*, which

frequently occurs in the literature as *A.* "*peliscypha*", a misspelling published by Theodore Fries (1860) based on the orthographic variant *Parmelia pelioscypha* listed by Wallroth (1831: 474). The orthographic variants *A. peliocypha* and *A. pelioscypha* are essentially synonyms: the first element from Greek pelios (πελιός) means "black; dark," and the alternative second elements are either from scyphos (σκύφος) meaning "cup" or from cyphos (κυφός) meaning "curved; the round of a cup." Since both variants are authentic, the original version *peliocypha* is not a correctable error and must be accepted.

The oldest epithet for this species is Schrader's *squamulosus*, which Acharius and other early 19th century authors accepted as having priority. It is unfortunate that the later epithet "*peliscypha*" was taken up following Fries's work. We do not consider that conservation would be appropriate in this case. We prefer to follow the Code of Nomenclature (which seems to us a matter of justice, too) and resurrect the older epithet.

Material & methods

Specimens from GZU, H, M and the private herbaria of Kocourková & Knudsen (hb. K&K) and Jiří Malíček (hb. Malíček) were studied using standard microscopy and spot tests. Specimens were sectioned by hand and measurements were made in water. Amyloid reactions of the hymenium were studied in fresh undiluted Merck Lugol's solution (IKI) following Knudsen & Kocourková (2018). The excellent description by A.H. Magnusson (1929) was revised. Macrophotographs were taken using an Olympus DP74 digital camera mounted on Olympus SZX 7 stereomicroscope equipped with PRO-SZM1-Focus Drive Motorization for stacking pictures and stacked using the Olympus DeepFocus 3.4 module. The figure plates were processed with QuickPhoto Camera 3.2 software fitted with Promicra Publisher Module and eventually refined with Adobe Photoshop CS4 Extended ver. 11.0.

Taxonomy

Acarospora squamulosa (Schrad.) Trevis., Rivista Period. Lav. Regia Accad. Sci. Lett. Arti Padova 1: 263. 1853. Fig. 1

≡ *Lichen squamulosus* Schrad., Ann. Bot. (Usteri) 22: 84. 1797.

Type: Systematische Sammlung Cryptogamischer Gewächse, Fascicle II, no. 153, Germany. Niedersachsen, Harz, on rocks (**lectotype designated here**, M! MBT385224; isolectotypes, GOTE! L!).

≡ *Parmelia squamulosa* (Schrad.) Ach., Methodus, sect. post.: 181. 1803.

= *Parmelia peliocypha* Wahlenb., in Acharius, Methodus, suppl.: 40. 1803.

Type: Norway. Lappland, Nord Cap, on rocks, Wahlenberg s.n. [type not seen or located].

≡ *Acarospora peliocypha* (Wahlenb.) Th. Fr. [as "*peliscypha*"], Lich. Arct.: 89. 1860.

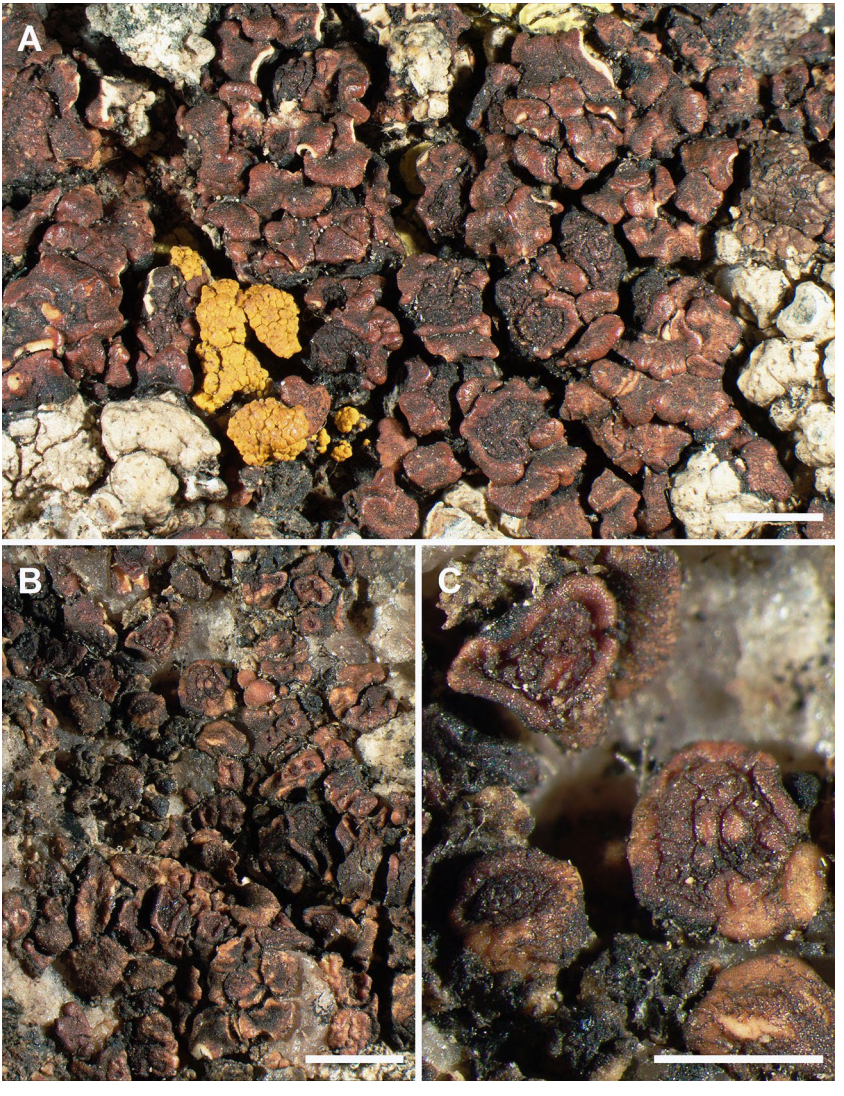

Fig. 1. *Acarospora squamulosa* (lectotype, Schrader No. 15, M): A. Subsquamulose imbricate thallus with apothecia; B. Crustose areolate thallus; C. Detail of apothecia with thalline margin and rugulose disc. Scale bars: A, B = 1 mm; C = 500 μm.

Thallus of areoles quite variable in size, as small as 0.5 mm and up to 3 mm diam., 100–500 μm thick, broadly attached, becoming sometimes lobulate and subsquamulose and sometimes imbricate, replicating by division. Upper

surface dark to light brown or reddish brown, shiny or matte, epruinose. Lower surface brown. Epicortex lacking or thin. Cortex 30–50 µm thick, upper layer brown, lower layer hyaline, cells round, 3–5 µm diam. Algal layer continuous to thin and scattered, 50–200 µm thick, algal cells 6–15 µm diam. Medulla thickening corresponding with areole size, hyphae thin-walled, 2–3 µm diam.

Apothecia usually 1 per areole, beginning immersed and (usually) becoming elevated in a thalline margin or expanding and thus reducing the areole to a thalline margin (pseudo-lecanorine), ≤1 mm diam., the disc epruinose, usually rugulose, usually round. Parathecium expanding around disc 10–30 µm without excluding thalline margin, 30–60 µm diam. Epihymenium 15–30 µm thick, coherent, brown to yellowish brown. Hymenium (including epihymenium but not accretions on disc surface) 100–120(–130) µm tall, hymenial gel IKI+ blue to red (hemiamyloid). Paraphyses 1.5–2 µm diam. at mid-level, apices unexpanded or expanded ≤3 µm. Asci 70–90 × 16–20 µm, 100–200 ascospores per ascus. Ascospores 3–6 × 1–2 µm. Subhymenium 25–50 µm thick, IKI+ blue (euamyloid). Hypothecium 10–30 µm tall. Pycnidia inconspicuous, ca. 100 × 60 µm, ampuliform conidiogenous cells 10–15 µm tall, conidia mostly 2 × 1 µm. Gyrophoric acid in cortex, C+, KC+ pinkish red in thin section, rarely cortical parts lacking a distinct reaction.

Selected specimens examined: **CANADA. Nunavut. Baffin Island**, Head of Clyde Fiord, on gneiss rock below a gyrfalcon nest, July 1950, M.E. Hale Jr. 372 (H). **CZECH REPUBLIC, Central Bohemia, Distr. Rakovnik**, Křivoklátsko Protected Landscape Area, Hracholusky, Čertova skála Nature Reserve, 49°59′52.535″N, 13°47′27.885″E, 345 m, on top of high outcrop above Berounka River, 14 July 1997, J. Kocourková 3727 (hb. K&K), Nezabudické skákly nature reserve, 50°1′10.02″N 13°51′2.34″E, 255 m, on spilite, 11 April 1996, J. Kocourková 9855 (hb. K&K), Roztoky, Na Babě Nature Reserve, 50°1′50.676″N, 13°52′18.069″E, 290 m, on steep rocky slope above Berounka River, on rhyolite, 17 June 1997, J. Kocourková 8471 (hb K&K), Týřovice, Týřov National Nature Reserve, Týřovické skály, w-facing rocks above Berounka River, 49°58′59″N 13°47′39″E, 330–420 m, on volcanic rock, 11 Jan. 2018, J. Malíček 12585 (hb Malíček). **Western Bohemia. Distr. Plzeň-sever**, Nečtiny, Preitenstein castle ruins, s- to sw-facing rocks below the castle, 49°57′37″N, 13°09′41″E., 550–580 m, on on spilite basalt, 13 April 2014, J. Malíček 7697 (hb Malíček). **FINLAND. Jämsä, Seppola**, 21 April 1934, A. Horkiverr (H); **Turku, Ruissalo Kalliolla**, on rock, 19 July 1922, V. Räsänen (H); **Kavidja**, on rock, 3 June 1908, K. Linkola (H). **NORWAY. Oppland, Ringebu**, near the village, on boulders in stone fence, 28 June 1925, A.H. Magnusson, Lichenes selecti scandinavici No 67 (H, GZU). **SWEDEN. Södermanland, Flemingsberg parish**, ca. 800 meters S of Masmo and just E of Lake Albysjön, 40 m, on S-facing exposed siliceous rock, 59°14′30″N 17°52′49″E, 10 April 2009, M. Westberg TU-3 (hb. K&K, 2 specimens). **RUSSIAN FEDERATION.** Kurkijoki [Kurkiyeki/Куркиеки], on schist, 8 August 1935, V. Räsänen (H). **Orenburg region, Mednogorsk district**, 14 km NE of Mednogorsk, vicinity of Yumaguzino the 2nd village, 51°32′41″N 58°38′50″E, 357 m, on basalt outcrops, 30 May 2013, A. Paukov (hb. K & K).

Ecology & distribution. Asia, Europe, North America, on various siliceous rock, on gneiss, rhyolite and basalt including spilite (Magnusson 1929, Golubkova 1988).

Discussion. Schrader's exsiccatae Systematische Sammlung Cryptogamischer Gewächse were published in two fascicles in 1796 and 1797. According to Sayre (1969), they did not include any descriptive text, although schedae for each fascicle were published in volumes 20 (1796) and 22 (1797) of Usteri's Annalen der Botanik. According to Stafleu & Cowan (1985), the schedae were also published in 1796 and 1797 as independent publications. It is not known therefore, whether the journal contains preprints or reprints, but we have assumed the former. We have not been able to consult the independent publications but assume that their text is word-for-word identical with the journal.

The name *Lichen squamulosus* was validly published in the journal adjacent to the number "153", an unambiguous reference to number 153 in the exsiccata. The name must therefore be typified on number 153 in the exsiccata. Because the exsiccata was issued in multiple copies, and we cannot be sure that each number represents a single gathering, a lectotype should be designated. We were able to locate only three specimens of number 153, one in the herbarium of Munich (M), one in Leiden (L), and one in Göttingen (GOET). The specimen in M is 7 cm in diameter and is designated here as the lectotype, as it can be easily studied without any damage. The specimen in L is too scanty for non-destructive microscopic and chemical examination, but does appear to belong to the same species, and is acceptable as an isolectotype. The specimen in GOET, which is smaller than the specimen in M and identified by F. Arnold who also did spot tests, is also an excellent isolectotype.

The lectotype and isolectotypes belong to the species widely known as either *Acarospora* "*peliscypha*" or *A. peliocypha*. Theodore Fries cited several names in synonymy, but as they are not validly published, proposed at an infraspecific rank, or cited with "p.p." or "?", his name is legitimate (Fries 1860). The correct spelling of Fries's epithet should be *peliocypha,* because he based his combination on *Parmelia peliocypha* Wahlenb., which he miscited as *P.* "*peliscypha*." Acharius (1803) himself considered *Parmelia peliocypha* to be merely a synonym of *Parmelia squamulosa*; but Wahlenberg, who named *P. peliocypha*, regarded it as referring to a good species. ICN (Shenzhen) Art. 36.1, Ex 3 (Turland & al. 2018) supports the name as validly published. We could not locate Wahlenberg's collection at BM, H, UPS, or S or in the literature. Magnusson (1929) did not state that he actually saw Wahlenberg's specimens,

only that Wahlenberg eventually incorporated *P. peliocypha* "for the most part" into his concept of *Lichen cervinus* Wahlenb., which may explain the lack of annotated *peliocypha* type material. We choose not to neotypify the name *P. peliocypha,* because we believe a type may well be found among Wahlenberg specimens of *L. cervinus.* It is also possible the type actually represents the morphologically similar species currently known as *Acarospora rugulosa* Körb. We base our synonymy on the consensus of Acharius (1803), Arnold (1880), and Magnusson (1929) that Wahlenberg applied *P. peliocypha* to the species known as *L. squamulosus.*

As often happened in 19th century, names were often based on one-line descriptions without examining the types. In this case the name *Lichen squamulosus* was misapplied to the species *A. macrospora* A. Massal. ex Bagl. (Magnusson 1929). In his discussion of the nomenclature of *A. macrospora*, Magnusson stated that *L. squamulosus* in Schrader's type was "for the most part" the species later called *Parmelia peliocypha,* but he wrote "to not cause perpetual confusion it is best to let this name sink into oblivion" (Magnusson 1929). It seems fairer that we not propose to conserve the name *P. peliocypha* but recognize the nomenclatural priority of *Lichen squamulosus* and not let it sink into oblivion. We oppose conservation because E. Acharius, F. Arnold, and A.H. Magnusson all recognized *L. squamulosus* as the same species as *P. peliocypha* (Acharius 1803, Arnold 1880, Magnusson 1929). Magnusson arbitrarily decided to accept the name *P. peliocypha* even though he recognized that the taxon was originally called *L. squamulosus*.

Acarospora squamulosa is an arctic and montane species in Europe, although it has been collected at elevations as low as 255 m in the Czech Republic (Magnusson 1929). Collections have been identified by A.H. Magnusson from Fennoscandia to Russia in Europe (Magnusson 1929). Golubkova (1988) reported *A. squamulosa* in eastern Siberia in Asia, and Magnusson (1929) reported the species from Greenland in North America. We identified a specimen from Canada during this study but have seen no other specimens of *A. squamulosa* from continental North America. The taxon reported as *A.* "*peliscypha*" from California and the Sonoran region is rare and represents an undescribed species that needs further study (Knudsen 2007; for picture see Knudsen & al. 2017).

Acarospora squamulosa can be confused with *A. rugulosa* [= *A. montana* H. Magn.]. *Acarospora rugulosa* has a higher hymenium (110–)125–140(–175) µm vs. 100–120(–130) µm in *A. squamulosa,* and phylogenetic analysis supports *A. squamulosa* and *A. rugulosa* as distinct species (Westberg & al. 2015). The

two species can be identified accurately only by hymenium height, as they share overlapping morphological characters. *Acarospora rugulosa* is on the North American lichen checklist (Esslinger 2018) but we have yet to confirm this report.

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